

Exhibit C

Experimental Measurements of Overload Interference from WCS Transmitters to DARS Receivers and the SDARS Noise Floor

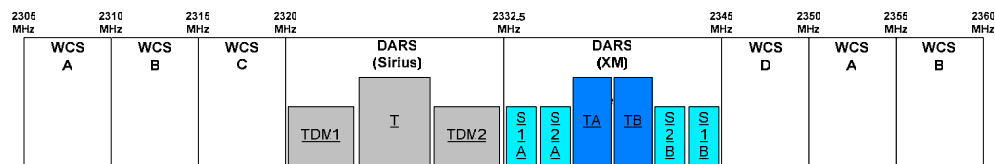
I. Introduction

XM has recently conducted a series of laboratory and field tests to establish the signal levels that would block the reception of the SDARS service satellite signals due to overload interference from devices deployed in the various WCS blocks.¹

Also attached to this section are tests that were conducted by independent engineering authorities at the EMI Research and Development Laboratory of the Florida Atlantic University to confirm the value of the received noise floor in the presence of no interference, appropriate for out-of-band emissions calculations in the DARS service bands, as well as to measure the overall path loss between the WCS transmitter and the Sirius receiver at a three-meter interference coordination distance.

The following chart illustrates the SDARS and WCS spectrum plans for reference in the following discussion:

Figure 1 WCS/SDARS Bandplan



The following assumptions were used during these tests:

- The WCS operators' deployment will be based on the 802.16e WiMAX standard.
- The services provided by the WiMAX providers will include a range of defined WiMAX profiles.
- The tests used standard off-the-shelf test equipment along with reference IEEE 802.16e WiMAX signals supplied by the test equipment vendor.
- An XM reference receiver was used for the tests. This represents the majority of the XM receiver platforms deployed in the market (including the automotive OEM market where typical product lifecycles are 10 years).
- The upper XM satellite ensemble signals were tested using the upper WCS frequency blocks (D, A-upper, B-upper) as the interfering sources.
- The tests were conducted with representative WCS uplink and downlink transmit profiles represented by the different WiMAX TX duty cycles.

¹ XM conducted these tests in coordination with, and under the supervision of, Sirius Satellite Radio, pursuant to the Special Temporary Authority issued by the Federal Communications Commission in January 2008 (File No. 0591-EX-ST-2007, Call Sign WD9XDT).

- The tests using the WCS D block were done with the assumption of zero guard band, although a guard band will be required for the WCS D block due to required filtering to meet the WCS out-of-band emission limits into the DARS band.
- In the case of the laboratory tests, the SDARS wanted signal was set to a reasonable satellite signal level on the ground for the testing at -100dBm.
- In the case of the field tests, the radio used was put into a test mode to select the individual signals that formed the basis of the test case.

II. Test Set-Up and Description

The test effort includes a laboratory component and a field component. The laboratory tests were designed to determine the overload levels (in dBm) for various XM receivers in response to WCS interference signals. XM defined the overload point to be the received WCS interference power at which the audio stream experiences interruption (*i.e.* muting).

The laboratory tests were executed in a conducted environment, with the instrumentation and relevant equipment connected by cable. The field tests were designed to determine the distances at which a WCS emitter causes overload interference to a XM receiver, as well as the maximum WCS transmit power required to interfere with a XM receiver at a two-meter distance.

Additionally, XM engaged a third party to measure our receiver's thermal noise floor.

II.a. Laboratory Tests

II.a.I. Test Setup:

The XM signals used in the test cases were either SAT1B, SAT2B, or Terrestrial B (COFDM). XM signals were generated in the laboratory tests, while the field tests used the live, over-the-air XM downlink signals.

Overload tests were done with a single serving signal active (*e.g.*, SAT1B, SAT2B or Terrestrial B (COFDM)). The serving signals for SAT1B and SAT2B were -100 dBm, with COFDM set to -95 dBm.

XM created the WCS interference signals using an Agilent E4438C generator equipped with the capability to create and run WiMax-compatible waveforms. The waveforms are based on a mobile WiMax 5 MHz TDD profile at various duty cycles to emulate downlink or uplink traffic. The interference signals operated in the WCS A (upper), B (upper), and D blocks.

The test setup is shown below in Figure 2. The output of the WiMAX signal generator, centered at the WCS channel center frequency, passed through a band pass filter appropriate for each WCS block. After passing through an isolator and variable attenuator, the WCS signal was combined with the desired SDARS signal through a

directional coupler. The composite signal was then split, with one path routed to a spectrum analyzer/power meter (Rhode and Schwartz FSQ-26) for monitoring the signal levels and the other routed to the input of a SDARS LNA. The LNA was originally embedded in an actual production XM antenna module, and removed and repackaged in a suitable enclosure for this effort. The output of the LNA was applied to the victim SDARS receiver input, and the receiver's audio output connected to a speaker to monitor and detect audio interruptions.

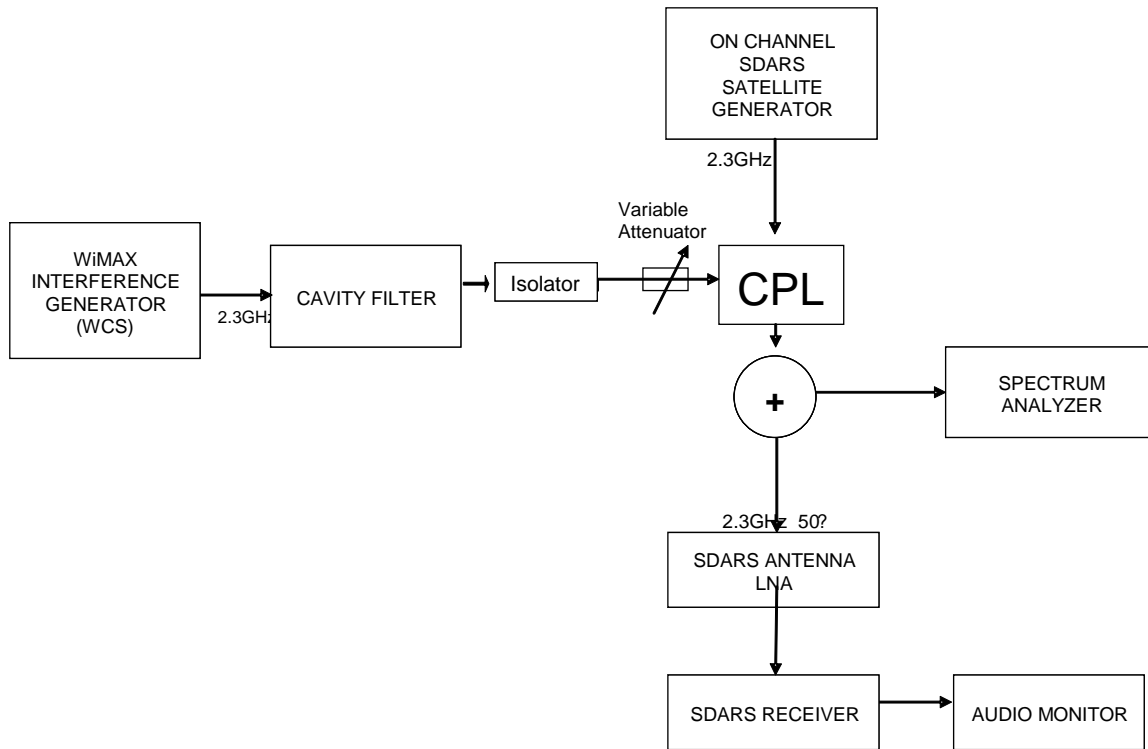


Figure 2 Laboratory Test Block Diagram

II.a.II. Laboratory Test Procedure:

For each test case, the test team used the following procedure to conduct the tests. The steps below are simplified and occur after the system has been configured and calibrated.

- Set the SDARS SAT1B/ SAT2B serving signal to a level of -100 dBm at the LNA input. For COFDM signals, the level is -95 dBm.
- For each SDARS serving signal, increase the WCS signal from a low level until audio muting occurs in the SDARS receiver.
- Reduce the WCS signal in 1 dB steps until audio is restored
- Fine tune the WCS signal level to the highest setting where the SDARS will play unimpaired audio for one minute. This setting is then recorded as the maximum tolerable WCS level before the onset of audio muting.

The preceding steps are repeated for each desired permutation of WCS Block, Duty Cycle, Receiver, and Serving Signal.

II.b. Field Tests

Field tests demonstrated the distances and signal levels at which signals from a WCS mobile device cause muting in the XM receiver. In contrast to the laboratory tests, these tests were conducted under best case conditions: in an open environment, with full satellite link margin. In addition, the test team executed a test to determine the net path loss between the WCS transmitter and SDARS receiver.

II.b.I. Field Test Setup:

Figure 3 shows the block diagram of the field test scenario. The WCS mobile transmission equipment consists of a signal generator (Agilent E4438C), amplifier (modified prototype XM μ Repeater PA), filter, dipole antenna, and required cabling. The signal generator output fed a power amplifier, and the signal levels adjusted to achieve the desired transmit power (*i.e.*, 112 mW for interference distance tests). The amplifier output is then fed into a band pass filter (selected by WCS Block) which is in turn connected to the antenna. The antenna is a dipole antenna with an overall antenna gain of 0 dBi toward the horizon. The WCS transmitter equipment suite was mounted on a cart, with the antenna elevated approximately six feet above ground.

On the SDARS receiver victim side, the XM receivers were installed in the typical aftermarket fashion: antenna mounted on the middle portion of a minivan roof, with the receivers inside the vehicle. The test team inserted a directional coupler in-line with the SDARS antenna output to monitor the received desired and undesired signals on a spectrum analyzer. Figure 4 below shows photographs of the test setup in action.

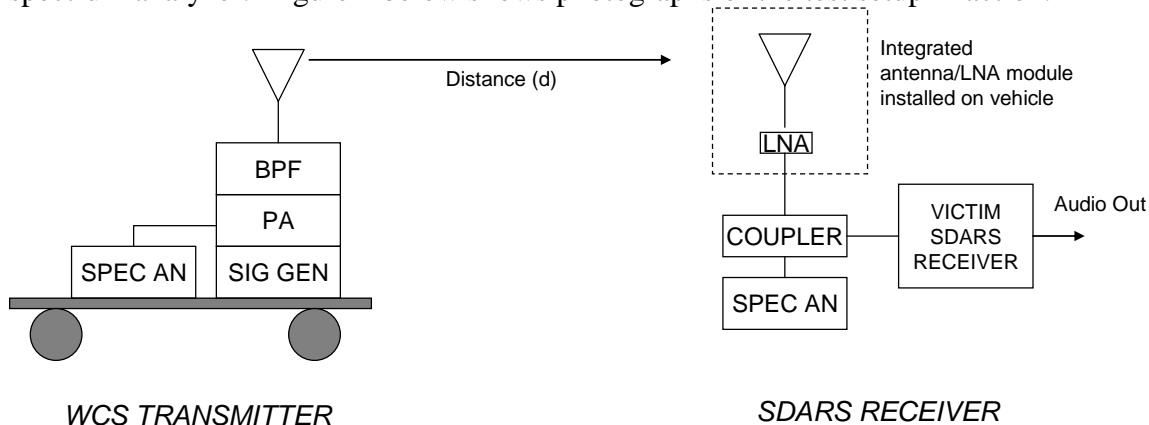


Figure 3 Static Field Tests Block Diagram



Figure 4: : WCS Transmitter Interference Distance Measurement Test where the WCS transmitter power was fixed at 112mW and the interference distance between the WCS transmitter and the XM OEM installed receiver was measured.

II.b.II. Field Test Procedure:

The test team first set the WCS transmitter to an EIRP of 112 mW (20.5 dBm). Starting from a distance close enough to cause the victim receiver to produce uncorrectable Reed-Solomon code word errors when decoding the satellite signal, the transmitter cart was moved away from the XM receiver in 1 meter increments until there were no uncorrectable Reed-Solomon code word errors. The test team then varied the position of the cart until at least 60 seconds of error free XM reception was observed. This process was repeated to confirm the measurement. The test team then logged the received power vs. distance.

A second test determined the maximum WCS transmitter power that allows error-free SDARS reception at a two-meter distance. For this test, the cart was fixed at a point two meters from the SDARS antenna. The test team increased the transmit power until the receiver produced uncorrectable Reed-Solomon code word errors when decoding the satellite signal, and then reduced the power in 1 dB increments until error-free reception was observed for 60 seconds. The corresponding transmit and received powers were then logged.

The separation distance test was performed on D-block using a Trilithic CFB-1453D filter ($f_0=2348.99$ MHz, 3 dB bandwidth = 5.5 MHz), with a 44% uplink WiMax signal centered on D-block ($f_0=2347.5$ MHz). The separation test was repeated with the WiMax 44% uplink signal centered on Au-Block ($f_0=2352.5$ MHz), but without using an Au-Block filter. The second test to determine the maximum interfering power at a two-meter separation distance was performed using only the D-block WiMax signal with D-block filter.

The field tests were performed under clear sky conditions with the test radios tuned to a B ensemble channel, which would experience the greatest potential interference from transmissions on WCS blocks D, A-upper and B-upper.

III. Test Results

III.a. Laboratory Results

Table 1 shows the maximum WCS interference levels, in dBuV/m, that still allow uninterrupted audio performance. Increasing the WCS interferer beyond these levels caused the onset of muting in the audio stream.

Table 1 Laboratory Test Results

WiMAX TX Duty Cycle	XM Wanted Signal	D		WCS - Upper Block A-upper		B-upper	
		Interfering Signal (dBuV/m)		Interfering Signal (dBuV/m)		Interfering Signal (dBuV/m)	
		XM Ref #1	XM Ref #2	XM Ref #1	XM Ref #2	XM Ref #1	XM Ref #2
50%	S2b	77.6	82.6	108.6	100.6	109.6	103.6
50%	S1b	77.6	82.6	109.6	98.6	108.6	102.6
7%	S2b	79.6	85.6	105.6	103.6	110.6	107.6
7%	S1b	79.6	84.6	103.6	103.6	108.6	106.6

III.b. Field Test Results

Table 2 below shows the minimum distance at which an XM satellite stream will play uninterrupted audio in the presence of a 112 mW WCS transmitter under clear line of site conditions with full link margin. Moving the WCS transmitter closer to the victim receiver caused the onset of uncorrectable Reed-Solomon code word errors, resulting in audio muting.

Table 2 Stationary Field Tests,-Distance to Mute With a 112 milliwatt WCS Transmitter

Band-Duty Cycle	D-44%	A-44% (no filter)
inno	6.7 m	10.1 m
SkyFi2	16.2 m	13.1 m

For the results in Table 3, the distance between the WCS transmitter and the XM victim receiver was fixed at two meters, and the WCS transmit power was varied. The results shown below indicate the maximum WCS transmit power before the onset of audio muting occurs.

Table 3 Stationary Field Tests-Measured WCS Transmitter Power at Onset of Muting at a 2 meter DARS receiver separation

Band-Duty Cycle	D-44%
inno	6 dBm
SkyFi2	-3 dBm

In addition to the tests discussed above, XM also measured the received power at the receiver as the transmitter was moved away in one-meter increments. Using the known received and transmitted powers, we then calculated the overall path loss between the two antennas. The calculated overall path loss is in agreement with the loss assumption of Free-Space-Loss + 3 dB applied in the analysis throughout this document, confirming our assumptions.

III.c. Noise Floor Test Results

The results of the noise floor tests are shown in Appendix 1. This data confirms that the operating noise floor for the XM satellite service is -113 dBm in the 4 MHz channel.

IV. Discussion of Results

These test results showed the following:

- The level that DARS receivers experience overload interference can be broken down into two major categories.
 - WCS D block (Muting at < 16.2 meters separation)
 - WCS Upper A&B block (Muting at < 13.1 meters separation)
- Previous proposals have assumed that a guard band would be required for WCS D block devices to meet the WCS out of band emission limits. However, if no guard band is in place, a level of 90 dBuV/m (-55 dBm) or lower WCS Field Strength at the satellite radio receiver would be required to protect the SDARS reception.
- The noise floor appropriate for out-of-band emissions calculations is -113 dBm in the 4 MHz channel.

Appendix 1

Noise Floor Measurement



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Technical Report No. 07-119a

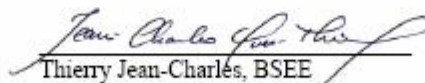
Noise Floor Measurement in the Satellite Radio Band for XM Satellite Radio Systems

Performed: 26 November 2007

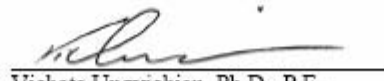
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1. INTRODUCTION

This document presents the results for the noise floor measurements for XM Satellite Radio Systems. The results apply only to the specific items of equipment, configurations and procedures supplied to the Florida Atlantic University EMI R&D Laboratory as reported in this document.

2. OBJECTIVE

This evaluation was performed to determine the sensitivity of XM Satellite Radio Systems in their Digital-Audio-Radio-Services (DARS) receive frequency allocation through noise floor measurements.

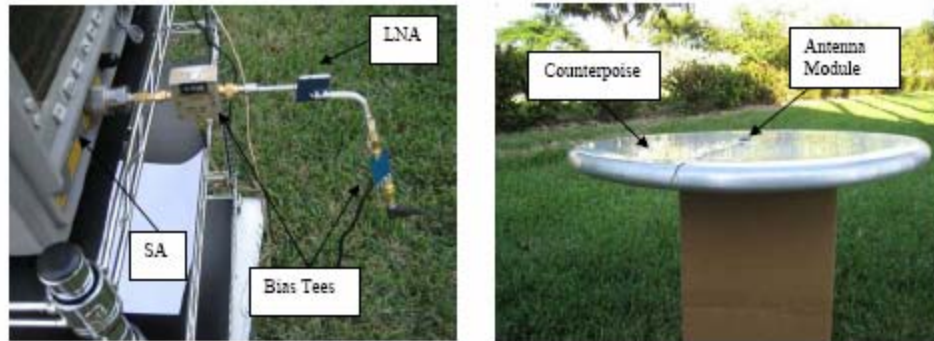
3. CONCLUSION

The noise floor levels for XM Satellite, in their corresponding DARS receive frequency allocation, were determined to -113.25 dBm (upper-edge of XM DARS band), as described in the following pages.

4. TEST PROCEDURES AND RESULTS

4.1 TEST PROCEDURES

The XM Satellite Radio receiver noise floor measurements were executed outdoor. The Satellite Digital-Audio-Radio Service (DARS) antenna module for the XM Satellite receivers, which consists of an antenna, a low-noise amplifier (LNA) and a 21-foot cable, was placed on a 3-foot diameter aluminum counterpoise. The antenna module was connected in series with a low-noise amplifier of 16-dB gain to the input of an Agilent E4404B spectrum analyzer (SA). Bias tees were used to activate the LNAs. Photographs 1 and 2 and Diagram 1 depict the measurement setup.



Photographs 1 & 2: Measurement Setup

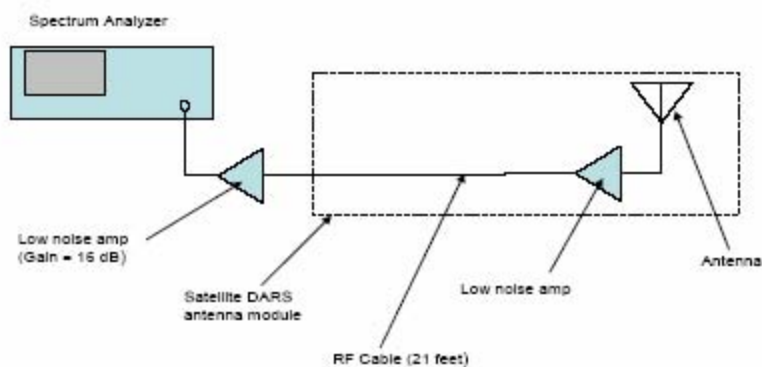


Diagram 1: Measurement Setup

4.1.1 XM NOISE FLOOR MEASUREMENTS

The DARS band corresponding to the XM Satellite Radio system was identified on SA (Diagram 2). Then the span was reduced to include only the DARS band covered by the XM SAT 1B and SAT 2B satellites, which ranges from 2341 MHz to 2345 MHz. Afterward, the location of the DARS antenna module with the counterpoise was changed so that the incident XM Satellite Radio signal is blocked by the test building. The noise floor of the system was measured using a resolution bandwidth and a video bandwidth of 3 kHz over the 4 MHz span. The data was recorded with SA on “max hold” and was averaged over 25 sweeps. Figure 1 shows the result for the noise floor measurements for the XM Satellite Radio receiver.

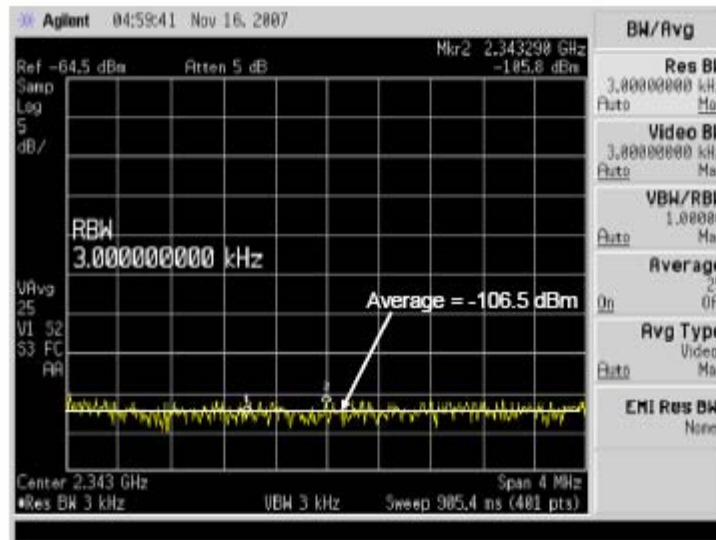


Figure 1: XM SAT 1B and SAT 2B Noise Floor Measurements

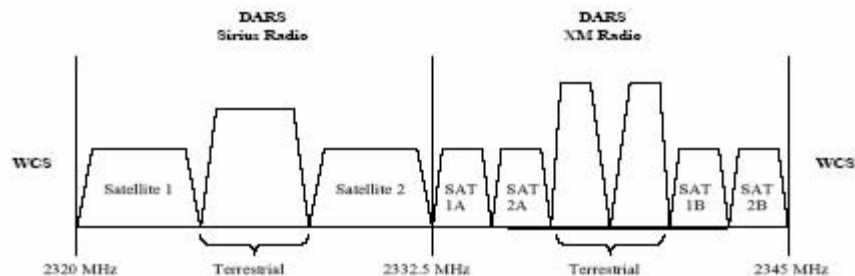


Diagram 2: DARS Receive Frequency Allocation

4.2 TEST RESULTS

Based on Figure 1 and the following parameters:

- Spectrum analyzer reading SA_NF (dBm)
- LNA in front of the Spectrum Analyzer, SA_LNA = 16 dB gain
- Spectrum Analyzer Resolution Bandwidth, RBW = 3 kHz
- Bandwidth of satellite signal, BW = 4 MHz
- Antenna module LNA gain (including the 21-foot cable loss), ALNA = 22 dB,

the calculated noise floor for the XM Satellite Radio receivers is recorded in Table 1.

Satellite Receiver	Figure No.	SA_NF (dBm)	SA_LNA (dB)	ALNA (dB)	BW (MHz)	RBW (kHz)	Calculated Noise Floor (dBm)*
XM	1	-106.5	16	22	4	3	-113.25

Table 1: Calculated Noise Floor at the Front-End of the Satellite Receiver

*Calculated Noise Floor (dBm) = SA_NF (dBm) - SA_LNA (dB) - ALNA (dB) + 10*LOG(BW/RBW)

Hence the calculated noise floor at the front-end of the satellite receiver is

- XM SAT1B & SAT2B
 - SA_NF = -106.50 dBm
 - Calculated Noise floor = -113.25 dBm

MAJOR TEST EQUIPMENT

Equipment Type	Manufacturer	Description	Model	Serial No.
Spectrum Analyzer	Agilent	9 kHz - 6.7 GHz	E4404B	MY41440110

End of Report